

XXVIII. *On the habits and affinities of Apocrypta and Sycophaga, of the Hymenopterous family Agaonidæ, with description of a new species of Apocrypta from the figs of Ficus Sycomori of Égypt.*

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[Read November 6th, 1878.]

DR. COQUEREL has described and figured three very remarkable insects, which he named *Apocrypta paradoxa*, *A. perplexa* and *Sycocrypta coeca*, in Guérin's "Révue de Zoologie" for 1855 (2e série, tome vii. 365 and 462), obtained from the figs of *Ficus terragena* in the Island of Mauritius. Conceiving these insects to be in an immature condition, he sought for them repeatedly during several successive months and always found them in the same condition, exhibiting the three types by hundreds mixed up together. They were all destitute of eyes or ocelli, whereof he could find no trace whatever (aucun vestige), nor of wings or elytra; neither was he able to discover any maxillæ or palpi, although armed with powerful mandibles.

Finding that these strange beings retained the same forms for a long period, and observing in one of them a certain resemblance to the *Scleroderma* of Latreille (which the *Sycocrypta*, in the structure of its head and thorax, serves to suggest, although essentially differing, not only in the antennæ, legs and abdomen, but more especially in not being *aculeate*), Dr. Coquerel considered them to belong to the *Heterogyna* of Latreille, upon whose supposed affinities he comments; speaking of these insects as being, in his opinion, "les femelles aveugles et aptères de quelque mâle ailé et inconnu;" and as "étranges parasites, condamnés à une obscurité éternelle, renfermés qu'ils sont dans une cavité close de toutes parts, privés d'ailleurs des organes de la vue."

In company with them he also found a considerable number of supposed *Chalcidites*, which, as he observes, "selon toute apparence s'étaient développés à leurs dépens," and living promiscuously (pêle-mêle) with the

aforesaid; being met with, like the former, among the viscid matter surrounding the seeds (“drupes”), as well as within the same (“dans l’intérieur des drupes elles-mêmes,” p. 367).

These supposed parasitic associates were furnished with eyes and wings, and some of them had been seen hovering about the figs in the first instance. How they were to obtain their eventual liberation from such closed prison without their blind victims being simultaneously emancipated when the figs burst or decayed; or how these latter captives, condemned to perpetual duration and obscurity, were to deposit their ova in other figs; is not explained.

Dr. Coquerel describes and figures this *Chalcis*? (*sic*) under the name of *C. explorator*; in whose wing the short curvate vein emanating from the anterior margin (or more precisely from the cubitus) shows a close affinity with *Blastophaga*; whereof one species (the *B. Sycomori*) is figured and described by Professor Westwood, together with the allied genus *Sycophaga* (of which *S. crassipes* is the type), in our Transactions for 1837 (Vol. II., pp. 220, 222, Pl. XX. fs. 4 and 5); but Coquerel’s insect differs from *Blastophaga* in the structure of the antennæ, as well as in the length of the ovipositor, which he describes as about twice the length of the body; whereas it is very short in the latter, being less than half as long as the abdomen. The mouth-parts are not adverted to by Dr. Coquerel; but in *Blastophaga* the mandibles are furnished with a remarkable appendage (Westwood, loc. cit. fig. 4, b—f), which is not found in *Sycophaga*, to which Coquerel’s supposed *Chalcis* is more closely allied in its antennæ and ovipositor.

Walker, in his “Notes on *Chalcidie*” (Part IV. p. 60), pronounces this to be an *Idarnes*, and repeats Coquerel’s figures of *Apocrypta* and *Sycocrypta*; speaking of these as exhibiting the most aboriginal structure of the *Agaonidæ*, which he characterizes in the aggregate as the most rudimentary form of the *Chalcidie*. He subsequently refers to *Idarnes* as allied to *Blastophaga* and *Sycophaga*, and as resembling the latter in having “a long oviduct” (p. 64).

But *Blastophaga* (as the name implies) is not of carnivorous habits; it is described by Gravenhorst as piercing the germs of the fig with small round holes, the interior of which germs is devoured by the larvæ, and

wherein he believed they undergo their metamorphosis.* Hasselquist, also, in his "*Iter Palæstinum*" (edited by Linnæus in 1757), says of his *Cynips Ficus*, "germina excavata ab illo reperi, et in quovis fere germine unum reconditum." The like habit applies to *Sycophaga*, as shown by some of the specimens now exhibited, where several are seen emerging from the seeds of the sycamore fig.

The *Cynips Caricæ* of Hasselquist, found in the same figs with his *C. Ficus*, was considered by him as possibly the other sex of the latter (an præcedens ex altero sexu? An diversa species? *Iter*, p. 425); although he minutely describes the oviduct of each; the comparative length of which (given in the *C. Caricæ* only) is stated to be "corpore duplo longior." These were subsequently united by Linnæus in his 10th edition of the "*Systema Naturæ*" (1758), wherein he refers to Hasselquist's Nos. 111 and 112, under the name of *Cynips Psenes*.

Hasselquist's specimens were obtained near Smyrna, from the "*Ficus Caricæ orientalis*" (Linn. loc. cit.); but those of Gravenhorst, all females, were derived from the *Ficus Caricæ* of the Tyrol; and, in describing his *Blastophaga grossorum*, ♀, from that locality, he expresses his inability to pronounce an opinion as to its generic identity with the aforesaid, having never seen Hasselquist's specimens, nor found a sufficiently accurate description thereof.

Professor Westwood has since shown (loc. cit.) that the *Cynips Sycomori*, ♀, of Egypt (ticketed as such in the Linnæan cabinet with Hasselquist's No. 113 by Linnæus himself), is a true *Blastophaga*. But in the *B. grossorum* the oviduct is described as "longitudinæ dimidiæ aut terciæ partis abdominis," and in *B. Sycomori* as "abdominis dimidii fere longitudinæ;" that of *Cynips Caricæ*, Hasselq., being, as aforesaid, *twice the length of the body*: his *C. Ficus* is stated to be entirely red (corpus totum rufum), all the examples of *C. Psenes* in the Linnæan cabinet being rufescent, with an elongate oviduct; whereas, in the European species, the females, as described by Gravenhorst, and as exemplified in specimens from Montpellier, received from M. Jules Lichtenstein, are *glossy-black* (nigroænius, Gr.). Thus, the *B. gros-*

* "Disquisitio de *Cynipe Psene* Auctorum, et Descriptio *Blastophagæ* novi *Hymenopterorum* generis." *Beiträge zur Entomologie*; Breslau; Part I. 1829.

sorum of Europe must be regarded as perfectly distinct from the Oriental type represented by the *Cynips Psenes* of Linnæus.

In none of these instances is any clue afforded to the *males*. But the Montpellier specimens were associated with many *apterous* individuals, somewhat approximating to the *Sycocrypta* of Coquerel; while an allied species of *Apocrypta* (now exhibited) has been recently found in the sycamore figs of Egypt, consorting in broods with the *Sycophaga crassipes*; as Coquerel's *Apocrypta* were met with in the Mauritius figs of *Ficus terrageua* in company with his *Idarnes*: and the habits of all, as emanating from the seeds, being identical, it would seem to be conclusively shown hereby that the *apterous* forms are, in reality, the *males*, and not, as Coquerel conceived, the females of some unknown males; thus leaving his *Idarnes* equally without a partner: nor does it appear that any other species of this genus or family has hitherto been wedded to a recognized mate.

In another allied genus, the *Sycobia* of Walker (Notes on Chalcid, p. 60), found in the figs of the *Ficus Indica* of Hindostan, a brood of "*neuters*?" or "*workers*?" has been described, which are *apterous* ("Alæ nullæ"), with "long curved mandibles like those of *Scleroderma*," and having "some resemblance to *Apocrypta* and *Sycocrypta* in the structure of the abdomen," furnished "with two apical appendages which equal it in length and resemble the *cerci* of the *Dermaptera*." They have eyes and 8-jointed (?) antennæ, with the 1st joint much incrassated. The same inferences point to these as the *males*.

In the Montpellier specimens, associated with *Blastophaga grossorum* ♀, Gr., the abdomen of the males is sharply deflexed and entirely concealed by doubling beneath the thorax; whereas in Coquerel's *Sycocrypta* it is turned *upwards* instead of *downwards*, passing over the thorax and projecting far beyond the head ("l'extrémité bilobée du thorax repose sur le sol, l'abdomen se dirige *en haut*, et dépasse de beaucoup la tête." Coq. l. c. p. 424). In the aforesaid males of *Blastophaga*, it consists of a large globose basal distention, constituting four segments; which are followed by three more, forming a short tube, gradually tapering to an obtuse apex;* the

* Dr. Coquerel, while assigning *five* segments to the globose section of the abdomen in his *Sycocrypta*, considers its attenuated prolongation to

head, however, is not elongate-oval, posteriorly truncate, as in *Sycocrypta*, but nearly circular, rather broader at the base and notched in front at the insertion of the antennæ, which are very short, triarticulate, fleshy, and tumid at the apex; their mouth being furnished with short, powerful mandibles, strongly bidentate at the extremity, while exhibiting distinct *black eyes* placed on each side of the disc. The thorax is much elevated and compact throughout, somewhat broader than the head; the posterior tibiæ being strongly outcurved, and the thorax thus raised and adjusted by the posterior tarsi. Their colour is stramineous at first, becoming rufo-fulvous when desiccated; and their total length, with the abdomen extended, is about 2 mill.; that of *Sycocrypta coeca* being stated at from 4 to $4\frac{1}{2}$ mill.

No *Blastophagæ*, nor any species corresponding with *Sycocrypta* or *Apocrypta perplexa*, were met with in the Egyptian sycamore figs, in company with the other type furnished with the peculiar caudal processes, considered by Dr. Coquerel as bronchial appendages, the large tracheæ abutting thereon; and, in accordance with the analogies witnessed in other instances, this Egyptian species, differing from *A. paradoxa* in the structure of the antennæ, thorax, tibiæ and abdomen, as described in the sequel, and domiciled in broods with *Sycophaga crassipes*, ♀, must obviously be regarded as its *male*.

Their life history appears to be as follows: Among hundreds of sycamore figs examined during the months of September and October, *all* the females found in these figs were denuded of their wings; being apparently *hibernating* females of the previous year, which obtain access to the interior by a minute hole which they make in the so-called "eye" of the fig, for the purpose of depositing their eggs in the seeds *from within*. For thus penetrating themselves through the exterior, their acute falcate mandibles are admirably adapted. *Every* small unripe green sycamore fig contained from three to six of these dead or effete wingless females. Possibly those figs not thus attacked fall off the tree; to provide against which, as well as to promote maturity, caprification is said to be resorted to in the case of the domestic fig. Towards the

consist of *five* more; ascribing *eight* segments to *A. paradoxa*, and only *four* or *five* (quatre à cinq) to *A. perplexa*.

end of October the new brood appears. When the figs ripen in November, the young and active females gnaw a series of small holes round the original aperture, and issue therefrom; but eventually the entire tuft of stamens falls in, and affords a readier means of egress. The Arabs are accustomed to make an incision in each fig at an earlier period, apparently for a similar purpose, in lieu of caprification;* and in such slit figs, when ripe, no winged females are met with, which avail themselves of such opening to evade, leaving the males only, which are found *dead* within. Few of these have escaped mutilation in their legs or caudal appendages from the potent mandibles of their blind comrades. They are apt to assume at times a crouching attitude by doubling their abdomen beneath the thorax (like the *Blastophagæ*); their compressed segments being entirely concealed thereby, the caudal appendages widely projecting on either side, and the posterior legs extended backwards; thus appearing as if cut in half.

SYCOPHAGA CRASSIPES, Westw., Mas.

Flavo-testacea, elongata, aptera, coeca.

Long. corp. $2\frac{1}{2}$ — $3\frac{1}{2}$ mill.

(Abdominis segmentis laxis nonnunquam usque ad $4\frac{1}{2}$ mill. productis.)

Caput elongatum, compressum, latum, pone mandibulas transversè depressum, angulatum, posticè emarginatum; disco stiiis rufis 5, maculâque irregulari prope antennarum basin nigrâ. *Antennæ* albidæ, carnosæ, 3-articulatæ, anticè utrinque porrectæ; articulo basali valdè dilatato, compresso; 2^{do} brevi, subtrigono; apicali duplò longiore, ovato-conico. *Mandibulæ* robustæ, tridentatæ, dentibus crassis. *Maxillæ* nullæ. *Palpi* obsoleti. *Oculi* desunt.

Thorax capite dimidio longior, gibbus; *prothorace* capitatis ferè magnitudine, subtùs abbreviato, lateribus obliquè fassis, rufo-striatis; *mesothorace* parvo, scutiformi; *meta-thorace* vix majore, posticè latiore, rotundato. *Alæ* nullæ.

* While this paper is passing through the press, the following account of the operation performed by the Arabs on these figs has been received:—“An incision, not very deep, and about half an inch long, is made with a small knife across the centre of the fig, so that a little of the milky juices may exude; this causes them to ripen very rapidly, makes the fruit much better, and allows the insects to escape from within. This cutting process is effected when the fruit is very small and green. Figs which have not undergone this operation would be quite unfit to eat.”—E. HASELDEN.

Pedes breves; trochanteribus magnis; femoribus parum incrassatis; tibiis parvis, apice dilatatis, spinosis; tarsis tenuibus, 5-articulatis; articulo basali longiore; 2^{do} 3^{tio} et 4^{to} brevissimis; extimo elongato, unguiculis magnis valdè recurvis, pulvillo acuminato subtùs producto.

Abdomen elongatum, flexile, laxum, compressum, segmentis 7; basali parvo, semicirculari; 2^o anticè profundè emarginato; reliquis latitudine longitudinis, retractilibus; podice caudulâ longiusculâ, exarticulatâ, flexili, basi robustâ, deindè compressâ, deniquè filiformi, posticè deflexâ, apud trachearum aditum affixâ, disco marginibusque glabris, utrinque munito; genitalibus sæpè prominulis, dilatatis, subtùs retrò deflexis.

Habitat cum *Sycophagâ crassipede* commixtis, in Ægypti Ficus Sycomori grossis.

BLASTOPHAGA GROSSORUM, Grav., Mas.*

Straminea (vel rufo-fulva postquàm desiccata sit), aptera, oculis nigris, abdomine basi ventricoso.

Long. corp. 2 mill.; lat. $\frac{1}{2}$ mill.

Caput subrotundum, posticè latius, convexum, anticè truncatum, fronte angularitè excavato, disco levissimè punctato; oculis lateralibus, subrotundis. *Antennæ* brevissimæ, albidæ, carnosæ, ad marginem anticum ubi excavatum insertæ, 3-articulatæ; articulo 1^{mo} parvo, cylindrico; 2^{do} paulò elongato, dimidio basali latere excavato; extimo tumido, apice obtuso, latiore, setis parvis paucis instructo. *Mandibulæ* crassæ, subquadratæ, apice internè bidentatæ, externè ciliatæ.

Thorax capite duplò longior, paulò latior; compactus, gibbus; metathorace utrinque profundè excavato, spiraculâ sat conspicuâ, posticè truncato, appendiculato. *Alæ* nullæ.

Pedes antichi robusti; femoribus crassissimis; tibiis brevibus, apice valdè dilatatis, angulis semicirculariter productis, acutis; tarsis brevissimis, 2-articulatis; articulo 1^{mo} parvo, basi elongato, constricto, apice dilatato; 2^o maximo, inflato, ferè ut quatuor in uno conjunctis, unguiculis magnis. *Pedes* intermedii tenuissimi, lineares; tarsis elongatulis,

* Femina (secundum Gravenhorstii diagnosin). Color nigroænius, nitidissimus; fossa capitis rufa; ore ferrugineo; antennis fuscis (12-articulatis), articulis duobus primis rufo-ferrugineis, 4^{to} introrsum spina apicali porrecta; pedibus piecis, femoribus plus minus fusciscentibus, coxis et trochanteribus fuscis; terebra rufa (cæteris omissis).

5-articulatis, unguiculis tenellis. *Pedes* postici robusti; femoribus ut in anticis valdè incrassatis; tibiis brevibus, excurvis, apice dilatatis, angulo externo biuncinnato; tarsis 5-articulatis, articulis mediocribus, basali et extimo longioribus, unguiculis validis.

Abdomen elongatum, subter thorace plicatile; basi thoracis latitudine, medio latius; segmentis 7; basalibus 4 valdè inflatis, sensim deflexis; reliquis tubulum tenue, rectum, compressum, apice obtusum, constituentibus, intra quod genitalibus retractilibus.

Hab.—Europâ meridionali, in *Ficus Caricæ* grossis.

Gravenhorst considered the females of his *B. grossorum* to correspond with Pontedera's unnamed species (Anth. lib. 2, p. 172, tab. xi.); but certainly not coinciding with either the *Cynips Ficus* or the *C. Caricæ* of Hasselquist, which he thought distinct *inter se*. Pontedera speaks of finding both sexes of his species; defining the females as having an exerted ovipositor; whence his figures, as wanting this organ, have been supposed to represent the males; but he appears to have mistaken mutilated females, rest of their oviduct, for the other sex.

Gravenhorst has not described the mouth-parts in the female of *B. grossorum*, as not distinctly visible; with the exception of the outlying appendages, which he supposed to be *palpi*, but which Professor Westwood, in treating of *B. Sycomori*, ♀, has shown to be affixed to the *base of the mandibles*. In the Montpellier specimens the manducatory organs of the female agree with those of *B. Sycomori*; the *mandibles* being subquadrate and bidentate at the apex (like those of the male), externally ciliated, and furnished at the base, towards the inner angle, with an elongate, corneous, exarticulate, compressed spatula, transversely 5- to 7-serrated, projecting obliquely backwards under the head, gradually increasing in width and terminating in a broad rounded apex.

These remarkable appendages, nearly as wide as the mandibles themselves to which they are firmly attached, and more elongate, may possibly serve to relieve the latter by facilitating their opening when clogged with the viscous juices of the fig; the sharp transverse serratures in these spatulae—obliquely inclined—with the interstices sloping towards the thorax, affording a ready means of propelling the same, and, with them, the inner region of the mandibles, by the action of the dilated anterior tibiae.